Attachment H

Proposal # 2001- K 217 (Office Use Only)

PSP **Cover** Sheet (Attach to the front of each proposal)

Proposal Title: Juvenile salmon migratory behavior study in the North, Central and South Delta

Applicant Name: Natural Resource Scientists, Inc.
Contact Name: David A. Vogel
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Fax: (530) 527-GI81
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Amount of funding requested: $ 210,000 ($70,000 for each of 3 separable **tasks)**
Some entities charge different costs dependent on the source of the funds. If it is different for slate or federal funds list below.
State cost _____ Federal cost _____

Cost share partners? ___ *Yes* X No
Identify partners and amount contributed by each _____

Indicate the Topic for which you are applying (check only one box).

☐	Natural Flow Regime:;	☐	Beyond the Riparian Corridor
☐	Nonnative Invasive Species	☐	Local Watershed Stewardship
☐	Channel Dynamics/Sediment Transport	o	Environmental Education
☐	Flood Management	☐	Special Status Species Surveys and Studies
☐	Shallow Water Tidal/ Marsh Habitat	☒	Fishery Monitoring, Assessment and Research
☐	Contaminants	3	Fish Screens

What county or counties is the project located in? contra costa, Sacramento, Solano, San Joaquin

What CALFED ecozone is the project located in'! **See** attached list **and** indicate number. Be as specific as possible ~~Sacramento-San Joaquin~~ Delta (North, Central, and South)

Indicate the type of applicant (check only one box):

☐	State agency	C	Federal agency
☐	Public/Non-profit joint venture	☐	Non-profit
☐	Local government/district	o	Tribes
☐	University	☒	Private party
☐	Other: _____		

Indicate the primary species which the proposal addresses (check all that apply):

☒	San Joaquin and East-side Delta tributaries fall-run chinook salmon		
☒	Winter-run chinook salmon	☒	Spring-run chinook salmon
☒	Late-fall run chinook salmon	☒	Fall-run chinook salmon
☐	Delta smelt	☐	Longfin smelt
☐	Splittail	☒	Steelhead trout
☐	Greensturgeon	☐	Striped bass
☐	White Sturgeon	☒	All chinook species
☐	Waterfowl and Shorebirds	☒	All anadromous salmonids
☐	Migratory birds	☐	American shad
☐	Other listed TIE species: _____		

Indicate the type of project (check only one box):

☒	Research/Monitoring	☐	Watershed Planning
☐	Pilot/Demo Project	☐	Education
☐	Full-scale Implementation		

Is this a next-phase of an ongoing project? Yes ___ No X

Have you received funding from CALFED before? Yes ___ No X

If yes, list project title and CALFED number _____

Have you received funding from CVPIA before? Yes ___ No X*

If yes, list CVPIA program providing funding, project title and CVPIA number (if applicable).

*Received funding from USFWS for Delta telemetry study in 2000, but do not know if funding source was CVPIA.

By signing below, the applicant declares the following:

- The truthfulness of all representations in their proposal;
- The individual signing the form is entitled to submit the application on behalf of the applicant (if the applicant is an entity or organization); and
- The person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section 2.4) and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

David A. Vogel

Printed name of applicant

David A. Vogel

Signature of applicant

Signature of applicant

B. Executive Summary

Project Title: Juvenile Salmon Migratory Behavior Study in the North, Central, and South Delta Using Radio Telemetry

Amount Requested: $210,000 ($70,000 for each of **3** separable tasks)

Applicant: Natural Resource Scientists, Inc., P.O. Box 1210, Red Bluff, CA 96080; Phone: (530) 527-9587, FAX: (530) 527-6181; Contact Person: Dave Vogel, Senior Scientist (E-mail: natrsinc@aol.com)

Participants and Collaborators: Natural Resource Scientists, Inc. This project is intended to benefit the Interagency Ecological Program Agencies and CalFed Agencies

Project Summary: Resolution to problems associated with juvenile salmon migration through the Sacramento-San Joaquin Delta is fundamental to the overall CalFed Ecosystem Restoration Program (ERP) and the USFWS Anadromous Fish Restoration Program (AFRP). Considerable restoration efforts are being made to improve environmental conditions in the Delta (e.g., Delta export curtailments). The benefits and causal mechanisms for Delta actions are not well understood. This proposed research is intended to improve the understanding of juvenile anadromous salmonid migratory behavior in the Delta which would significantly enhance ongoing and future Delta ecosystem restoration efforts as well as defining the most appropriate water conveyance options. Information generated from this investigation will help determine if salmon outmigration is influenced more by the net movement of flow toward the south Delta pumps or by tidally-induced flows and identify important parameters affecting juvenile salmon migration. Juvenile salmon migration through the Delta is affected by numerous factors described in this proposal. In particular, this study will concentrate on tidal and net flow effects, fish migration rates, channel flow splits, and individual specific fish behavior. Natural Resource Scientists, Inc. proposes to use radio telemetry as the analytical tool to evaluate juvenile salmon migratory behavior at various locations in the Delta. Juvenile chinook will be fitted with radio transmitters, released at specific locations in the Delta and monitored to determine their individual behavior patterns as they migrate within the Delta channels. This information will allow for more informed decisions on future directions of the Delta ecosystem and Delta water management. For example, a better understanding of salmonid migratory behavior in the Delta is integral in choosing the most appropriate future water conveyance method and reducing adverse effects of water diversions on anadromous salmonids. In addition, reducing the uncertainties associated with our present knowledge of factors affecting outmigration salmonids in the Delta will assist in ensuring the most efficient allocation of restoration funds. The development of a hydrodynamic regime in the Delta that is favorable to the migration of all Central Valley anadromous salmonids (e.g., migratory cues) is a strategic objective for the CalFed ERPP.

C. Project Description

1. Statement of the Problem

It is widely recognized that mortality to all juvenile anadromous salmonids in the Central Valley occurs as the fish migrate through the Sacramento-San Joaquin Delta. These fish include Sacramento River steelhead trout, fall, late-fall, spring, and winter chinook salmon, East-Side Delta tributary and San Joaquin fall chinook and steelhead. Although the general mortality factors are known (e.g., predation, unscreened diversions), many site-specific causal mechanisms are not clearly understood. This circumstance is largely attributable to unknown fish migration behavior as the juvenile salmonids negotiate numerous Delta channels in a hydraulically complex, tidal environment. In addition, the Delta hydrology has been modified by the Central Valley Project (CVP) and State Water Project (SWP) water export operations. Unnatural flow patterns in the Delta are particularly evident in the channels of the southern and central Delta (CalFed 1999). Various forms of evidence indicate that south Delta export operations cause juvenile salmon mortality to some degree. One theory suggests that a portion of this mortality is caused by the net reverse flow in some locations within the Delta channels attributed to export operations. Longer and more complicated fish migration routes and complications in navigation caused by the hydrological effects of export pumping are among factors affecting juvenile fall-run chinook. The National Marine Fisheries Service (NMFS) has indicated that anthropogenic conditions in the Delta are a primary source of mortality for the endangered winter-run chinook salmon: "These problems are primarily related to changes in hydrology, whereby the timing, quantity, export and distribution of water flow into and through the Delta have been altered." …"The channel complexity, in conjunction with the tidal and reverse flow patterns, likely delays migration to the ocean, which increases the length of time that smolts are exposed to adverse conditions." (NMFS 1997) Those mechanisms likely apply to all Central Valley anadromous salmonids, although the extent of their effects may vary in relation to their individual life cycle periodicity.

Resolution to problems associated with juvenile salmon migration through the Sacramento-San Joaquin Delta is fundamental to the overall CalFed Ecosystem Restoration Program (ERP) and the USFWS Anadromous Fish Restoration Program (AFRP). Considerable restoration efforts are being made to improve fish and wildlife habitat in the delta (e.g., Delta export curtailment during the period of juvenile and yearling out-migration). The benefits and causal mechanisms for Delta actions are not well understood. This proposed research is intended to improve the understanding of juvenile anadromous salmonid migratory behavior in the Delta which would significantly enhance ongoing and future Delta ecosystem restoration efforts as well as defining the most appropriate water conveyance options.

b. Conceptual Model

There is a need to better understand the basic biology characterizing the migrating behavior of juvenile salmonids in the Delta to enable Delta restoration efforts to succeed. Empirical data on the behavior of outmigrating salmonids influenced by flow splits in the Delta channels, net

reverse flows, and tidal flows would assist resource managers in formulating options to improve fish survival. For example, information generated from this investigation will help determine if salmon outmigration is influenced more by the net movement of flow toward the south Delta pumps or by tidally-induced flows and identify the most important parameters affecting juvenile salmon migration.

Figure 1 shows a conceptual model of some of the factors that may affect anadromous salmonid migratory behavior in the Delta. Many of these factors are derived from NRS, Inc.'s recent project for the USFWS studying juvenile late-fall chinook migratory behavior using radio telemetry in the north Delta in January and February 2000 (Figure 2).

This project is not intended to address all of these factors but rather will focus on some of the most relevant based on our recent research results obtained in January and February 2000 (described in the following section). In particular, this study will concentrate on tidal and net flow effects, fish migration rates, channel flow splits, and individual specific fish behavior.

c. Hypothesis Addressed and Adaptive Management Considerations

This proposal addresses ecosystem management questions associated with managing anthropogenic alterations of Delta hydrodynamic processes compatible with desired future ecosystem-state conditions for Central Valley salmon production. The physical and hydrodynamic alterations have changed the Delta's natural ecological processes and affected the rearing and migratory habitat available for salmonids.

The purpose of this project is to utilize radio telemetry as an analytical tool to evaluate several hypotheses concerning juvenile chinook salmon migratory behavior in the Delta. This study will provide detailed, definitive data on individual fish behavior and very specific fish migration routes in the Delta. In a large degree, the basic design of this project is built on our prior experience using radio telemetry to study juvenile salmon migration in the Delta in 1996, 1997 (Vogel 1998) and 2000 (Vogel 2000) (Figure 2).

Based on our prior studies in the Delta, it appears that juvenile salmon may exhibit several important behavioral characteristics that have a significant affect on their migration. For example, many of the radio-tagged chinook tracked during January and February 2000 tended to move with the tides in the center portion of the mainstem channel in the San Joaquin and Sacramento Rivers. Also, site-specific conditions at flow splits and the proximity of juvenile salmon to the flow splits appeared to significantly affect the migratory pathway "chosen" by the

Hypothesis: Juvenile salmon migration is primarily influenced by net flow direction.

Hypothesis: Juvenile salmon outmigration in the Delta primary occurs in the mid channel portions of the Delta.

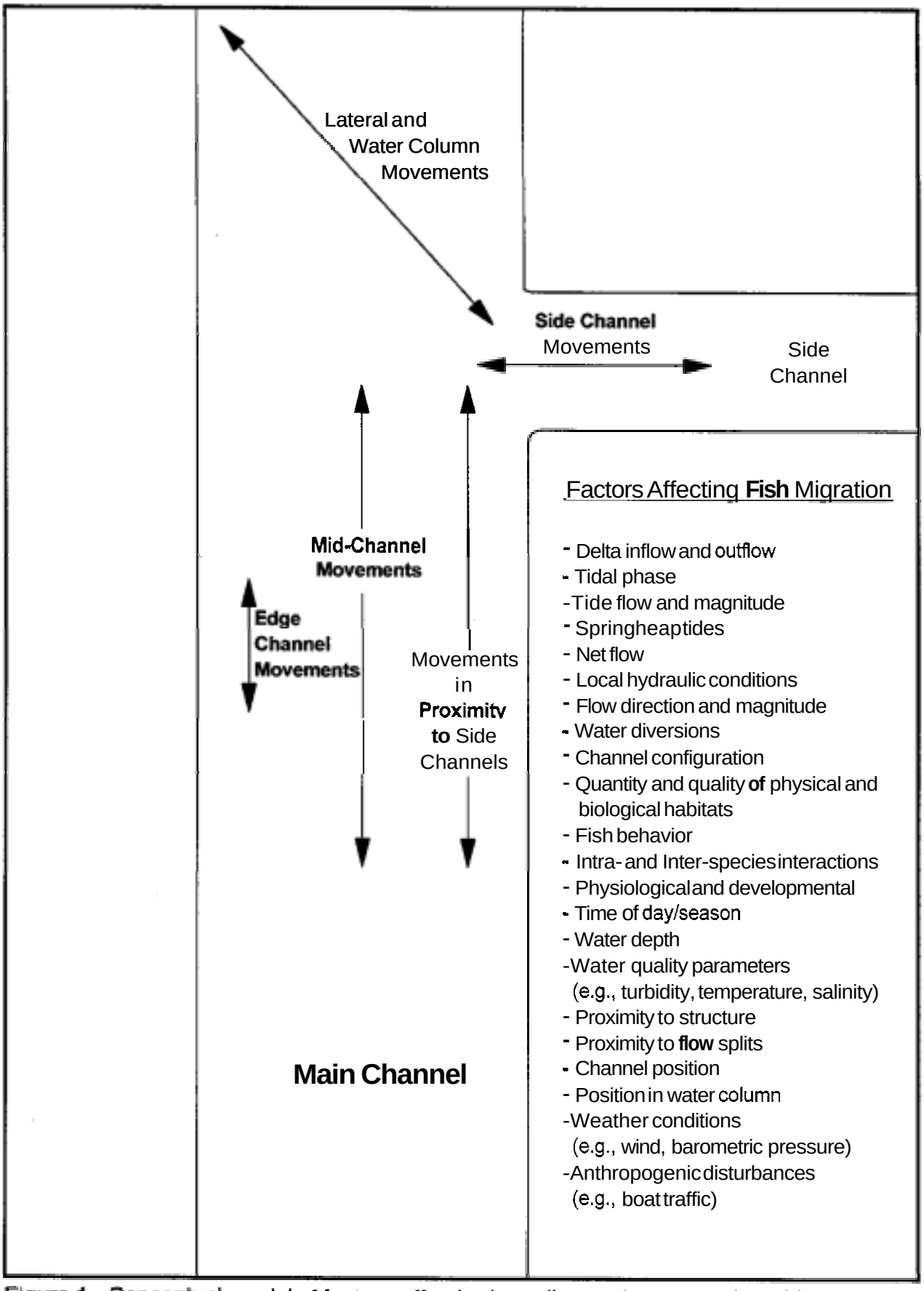


Figure 1. Conceptual model of factors affecting juvenile anadromous salmonid migration in the Delta.

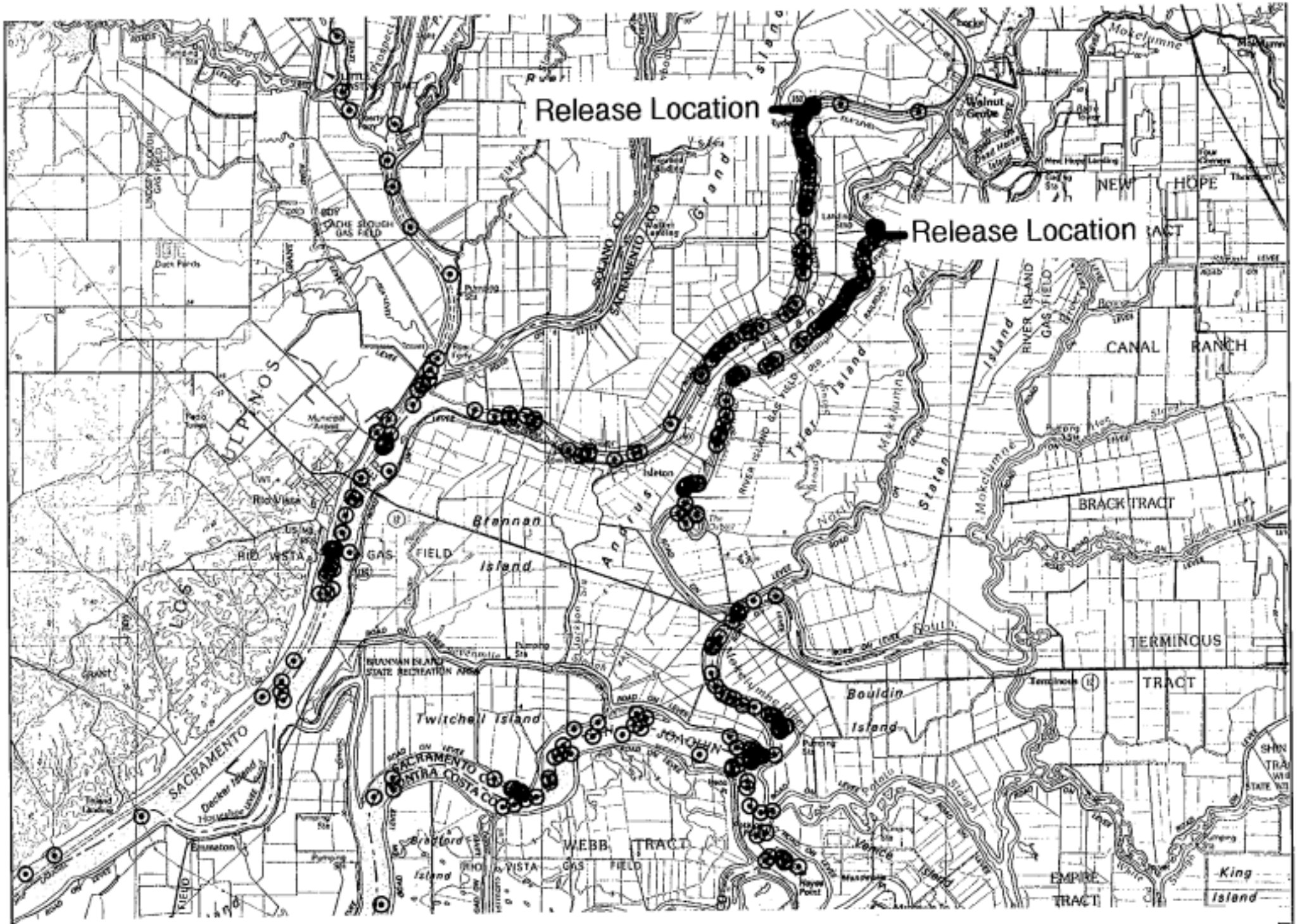


Figure 2. Locations of 50 radio-tagged juvenile chinook salmon released at two locations in the North Delta (January–February 2000) (preliminary data)

outmigrating salmon. Some of the telemetered fish exhibited a higher migration ***rate*** during ebb tides as compared to flood tides; i.e., the fish displayed overall net seaward movement despite strong seiching back and forth miles with the tidal cycles (Vogel 2000). Analyses are currently underway, using detailed DWR tide data and USGS UVM flow data to derive potential cause and effects on migration patterns of telemetered fish during the 2000 Delta radio telemetry investigation.

Hypothesis: Proximity of juvenile salmon to channel flow splits is a primary variable affecting migratory pathways in the Delta.

Other hypotheses than those described here will be evaluated as data are developed. For example, study fish may exhibit different migratory rates depending on the springheap tide cycle at time of fish release. Those evaluations will occur in an adaptive management feedback for study analyses. **As** more is learned about the hydrodynamics of the estuary and its effects on juvenile anadromous salmonids, direct and indirect modifications of estuarine processes in an adaptive management context will continue. **A** basic understanding of how effective Delta water operations and habitat measures have been for at-risk species such as Central Valley anadromous salmonids (e.g., improving outmigration cues) will be essential for an adaptive management feedback to continually improve Delta conditions for fishery resources. Data developed from this project will provide important information to allow for appropriate management for both water management and ecological restoration programs.

Hypothesis: Juvenile salmon exhibit a measurable higher migration rate on ebb versus flood tidal cycles.

The monitoring proposed in this project is essential to obtain data on anadromous fish migratory behavior to facilitate evaluation of the effects of past, present, and future restoration actions for salmonids in the Delta. In particular, the AFW identifies the evaluation of the effects of Delta hydraulic conditions such as net reverse flows on anadromous fish migration as a high priority (USFWS 1995 and 1997). Hypotheses for this project will be tested by monitoring specific movements and behavior of telemetered juvenile chinook salmon released at various locations in the Delta (described in scope of work).

Information derived from this project will significantly improve our understanding of juvenile salmon outmigration behavior through the Delta. These data will allow for more informed decisions on future directions of the Delta ecosystem and Delta water management. For example, a better understanding of salmonid migratory behavior in the Delta is integral in choosing the most appropriate future water conveyance method and reducing adverse effects of water diversions on anadromous salmonids. In addition, reducing the uncertainties associated with our present knowledge of factors affecting outmigration salmonids in the Delta will assist in ensuring the most efficient allocation of restoration funds. The development of a hydrodynamic regime in the Delta that is favorable to the migration of all Central Valley anadromous salmonids (e.g., migratory cues) is a strategic objective for the CalFed EWP.

2. Proposed Scope of Work

a. Location and/or Geographic Boundaries of the Project

This project will occur in the Sacramento-San Joaquin Delta Ecological Management Zone (Figure *3)*. Task 1 will occur in the Central Delta, Task 2 will occur in the South Delta, and Task *3* will occur in the North Delta. Depending on the specific task and the juvenile chinook salmon migratory pathways, the project may occur in Sacramento, Solano, Contra Costa, or San Joaquin Counties.

b. Project Approach

Basic Approach for all 3 Tasks

Natural Resource Scientists, Inc. proposes to use radio telemetry as the analytical *tool* to evaluate juvenile salmon migratory behavior at various locations in the Delta. Field data collection for this project will be designed to acquire information on specific behavior (movements) as juvenile chinook salmon migrate through critical reaches in Delta channels *to* evaluate our hypotheses. Juvenile chinook will be fitted with radio transmitters, released at specific locations in the Delta and monitored to determine their individual behavior patterns as they migrate within the Delta channels. This study is designed by adopting and expanding those successful methods and techniques we developed and employed from our prior studies on juvenile salmon using radio telemetry, including the recent study in the Delta during January and February 2000 for the USFWS (Figure 2).

Individual juvenile chinook (experimental fish) will be fitted with externally-mounted, miniature radio transmitters and allowed to recover from the surgical procedure in holding tanks at Mokelumne River Fish Facility or Coleman National Fish Hatchery. For the central and south Delta portion of the study (i.e., Tasks 1 and 2), Mokelumne hatchery yearling chinook will be used; for the north Delta portion of the study (Task **3),** Coleman Hatchery late-fall chinook will be used. We successfully used these fish during our prior Delta telemetry studies in 1996, 1997 (Vogel 1998) and 2000 (Vogel 2000). Control fish will also be fitted with non-functional ("dummy") transmitters of the same size and weight as functional transmitters and held in live pens at the hatchery and Delta release sites *to* monitor potential latent mortality and behavioral effects resulting from tagging. Fish will be tagged at the hatchery, allowed to acclimate overnight, and then will be transferred to **an** insulated, fish hauling tank with bottled oxygen aeration (1.5-3.0 liters/minute). The transport tank will be filled with water by adding approximately 5 g/liter NaCl to minimize osmotic stress during handling and transport (Carmichael and Tomasso 1988, Long et al. 1977, Wedemeyer 1992). Test fish will be transported to the Delta release sites the day after tagging and acclimated to conditions at the release sites prior to release. Additional untagged chinook ("escort" fish) of similar size will be held with experimental chinook to facilitate the benefits of natural shoaling behavior in young chinook upon release.

Fish releases will be timed to coincide with the morning flood or ebb tidal cycle. Prior releases

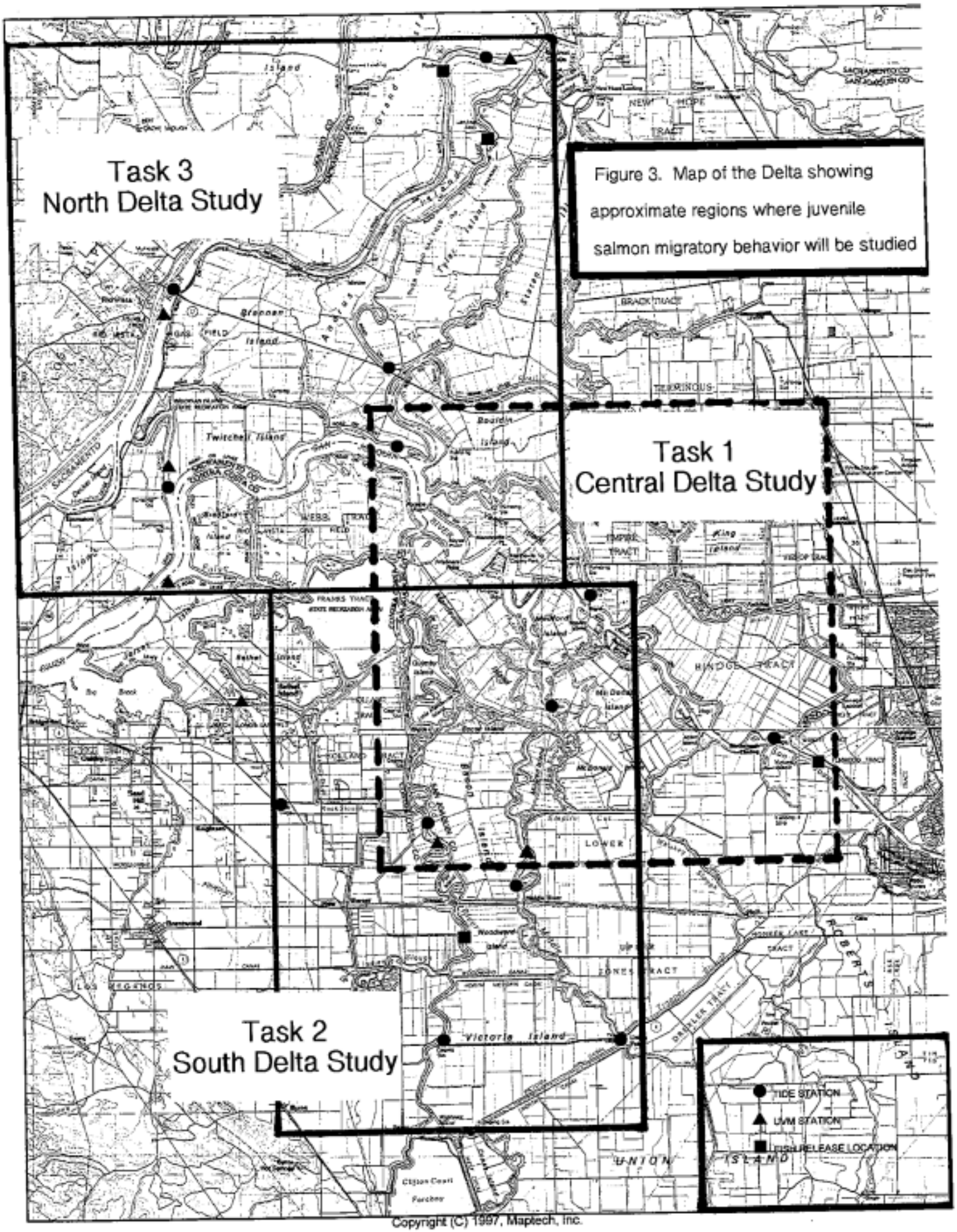


Figure 3. Map of the Delta showing approximate regions where juvenile salmon migratory behavior will be studied

of radio-tagged fish in the Delta have demonstrated that this experimental design will maximize data during the most relevant conditions of interest for this particular project. Because of the expect movement rate and distances traveled of radio-tagged fish with tidal cycles (Vogel 1998, 2000) this release pattern will maximize the observations in the Delta in the earliest phases of the monitoring efforts. Radio-tagged fish will be monitored for the first four days (approximately 12-14 hours/day, depending on season) following release. The primary tracking method will be with mobile receivers on inboard jet boats.[1] Unlike our prior telemetry studies in the Delta, this study will utilize the use of two, instead of one, jet boat for mobile reconnaissance each day. Also, fish will be tracked for four, instead of three, days. Individual fish movements and behavior in potential response to net reverse flow, tidal cycles, and flow splits in Delta channels will be important parameters assessed from field observations. Continuously monitoring fixed-station data recording receivers will be established within the migratory corridors to confirm migratory pathways and serve as backup stations should the fish not be located via the mobile receivers. Each time a radio-tagged fish is located, the exact position (via GPS), time, and any relevant biological and behavioral observations will recorded. Potable-water-safe dye will be released to determine tidal direction. Radio-tagged fish locations, specific movement patterns, and behavioral observations will be recorded on schematic plan view maps of relevant locations in the Delta.

Concurrent with the period when experimental fish are in the Delta, coordination with USGS Sacramento staff will be needed to obtain UVM data at relevant sites in the Delta and DWR staff to obtain other Delta hydrological data, such as 15-minute tide stage readings for relevant stations (Figure **3).** These latter data will be invaluable for interpreting study results.

This tag and release pattern will be repeated for a total of 50 radio-tagged fish at each of three regions in the Delta (Figure **3).** The exact fish release locations may be modified based on initial discussions with IEP agency staff. The delineation of these boundaries is approximate based on our prior experience radio tracking juvenile salmon in the Delta; some overlap of the regions will obviously occur. For each of the tasks, telemetered salmon will be released over a four-week period to ascertain potential differences within a spring/neap tide cycle. High quality, detailed maps of salmon migration data through the Delta will be developed for the final reports.

Task 1 (Central Delta Study):

This task will coincide with the timing of the mid-April to mid-May Vernalis Adaptive Management Plan (VAMP) flow study period on the San Joaquin River. The fish release location will established in the San Joaquin River downstream of the head of Old River and

[1] Based on our extensive radio-tracking of yearling chinook during prior experiments performed in the Delta (Vogel 1998, 2000), it was apparent that most outboard boat engines create significant radio receiver interference which greatly diminishes the effectiveness in monitoring of radio-tagged fish. We therefore employed the use of an inboard jet boat during monitoring activities to eliminate this problem. This also allowed for the necessary rapid coverage range of telemetered salmon migration in the Delta at any given time.

upstream of the Turner Cut flow split. In particular, this task is intended to evaluate what occurs during the telemetered salmon migration past the flow splits at Turner Cut, Columbia Cut, and lower Middle and Old Rivers. Twelve to 13 radio-tagged salmon will be released during each of the four weeks during the VAMP flow study period and monitored as previously described.

Task 2 (South Delta Study):

This portion of the study focuses on the localized net flow conditions in the south Delta and how those conditions affect juvenile salmon migratory behavior. The south Delta possesses the highest degree of altered hydrodynamics in the Delta because of the proximity to the state and federal export facilities. This particular task will be useful in segregating the specific effects of net flow and tidal flow effects on juvenile salmon migratory behavior. Experimental fish and control fish will be transported to the south Delta at Woodward Island approximately five miles north of the State Water Project's Clifton Court forebay (Figure 3). Two continuously monitoring fixed-station data recording receivers will be established at Clifton Court forebay and in Old River north of the fish release site to confirm migratory pathways and serve as backup stations should the fish not be located via the mobile receivers. The design for this task will maximize the fish exposure to the south Delta export facilities and will concentrate experimental fish in the south Delta during the initial phase of monitoring activities. This recommended fish release location and timing are likely to minimize the number of flow splits in which test fish have to negotiate during the initial phases of monitoring activities and maximize the opportunity to acquire data during the expected life of the radio transmitter battery. It will also maximize the ability to ascertain the radio-tagged salmon's ability to negotiate net reverse flows as compared to tidal influence.

Task 3 (North Delta Study):

This task will be an expanded version of the work performed in the north Delta for the USFWS during January and February 2000. Twenty-five radio-tagged salmon will be released in two separate releases of 12-13 fish in different weeks near Ryde on the Sacramento River and 25 radio-tagged salmon will be released in *two* separate releases in northern Georgiana Slough. This tag and release pattern will be repeated for a total of 50 radio-tagged fish during November and December 2001

Task 4: Project Management (including development of a monitoring plan)

A monitoring plan according to CalFed guidelines will be developed within the first month of this project. Additional detail is provided in the "Monitoring and Data Collection Methodology" section of this proposal. The Project Manager will manage the project cost and schedule, coordinate and communicate with IEP agency staff, and provide financial reports to CalFed or the CalFed contract administrator. NRS, Inc. will prepare quarterly reports summarizing degree of completion, activities during the reporting period, costs incurred, project milestones, and additional information described in the CalFed 2001 Proposal Solicitation Package. The project

management task and all reports are provided by NRS, Inc. as an in-kind contribution to this project.

c. Monitoring Plan and Data Collection and Evaluation Approach

Included in this proposal's scope of work is the development of a project monitoring plan that will be developed in collaboration with CalFed, and relevant IEP agencies. Data collection and evaluation are described in the project approach and hypotheses testing.

d. Expected Work Products

Progress reports will be prepared quarterly according to CalFed guidelines. At the end of the project, a technical, peer-reviewed draft and final reports for the project will be completed describing all work performed and study results, including methodologies, data acquired during radio tracking salmon in the Delta, and the analysis of results. In addition to the written report, up to two formal technical presentations will be given to applicable symposia or meetings (e.g., IEP annual meeting) within a year following the field study. All work products will be provided by NRS, Inc. as an in-kind contribution to this project.

e. Work Schedule

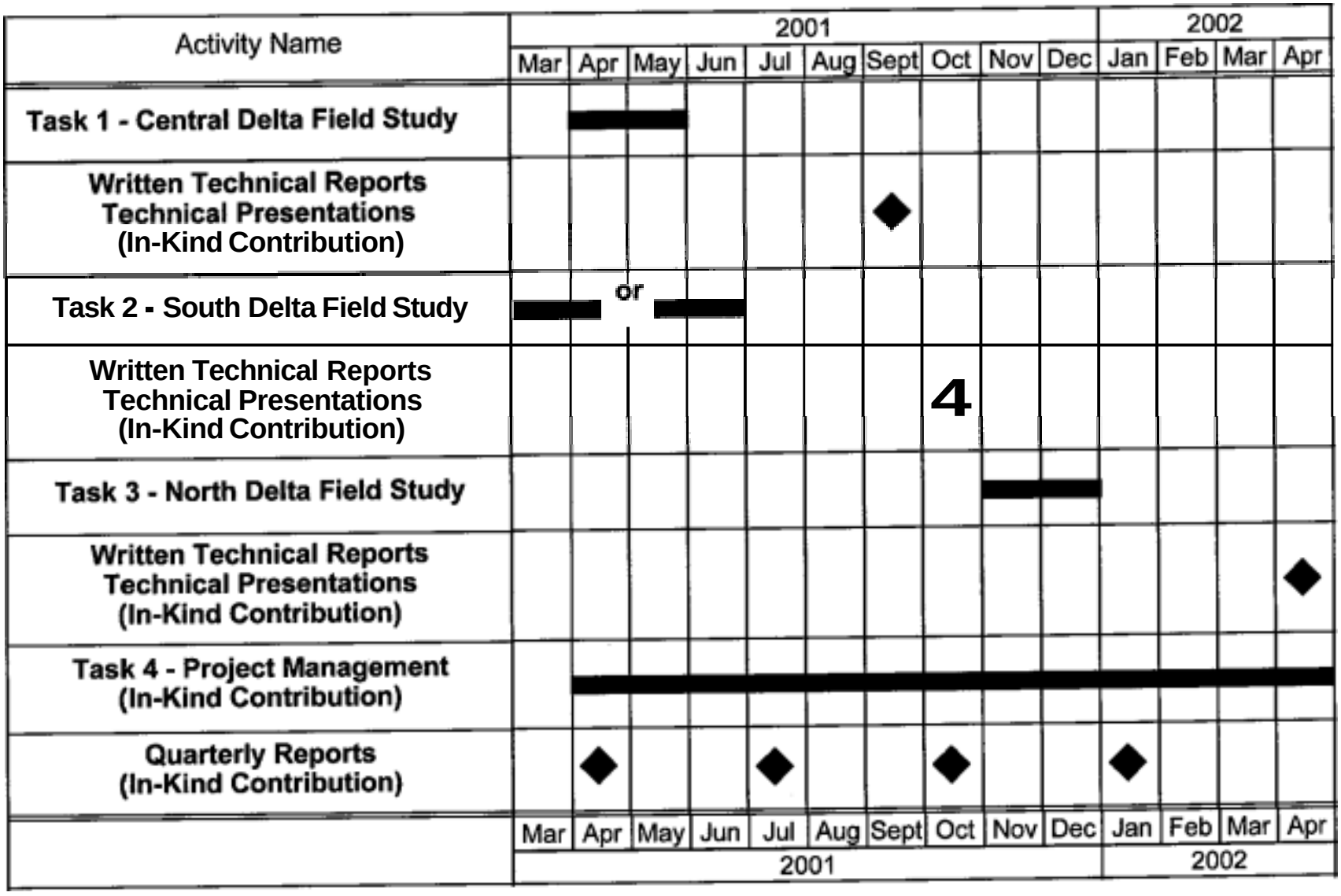
Task I (Central Delta)

Preliminary field reconnaissance and preparations would be performed during March 2001 (Table 1). The field portion of the study releasing and tracking radio-tagged chinook would be conducted during April 2001 and May 2001 during the VAMP study period. A draft report will be prepared and submitted for peer review by appropriate members of the IEP by September 2001 and a final report, incorporating reviewer comments, will be completed and submitted within a month after receipt of comments. Up to two presentations will be given (on request) to scientific seminars or workshops in California within one year after completion of the study.

Task 2 (South Delta)

This task could be performed either just prior to or just after the mid-April to mid-May VAMP study period on the San Joaquin River (Table 1). Preliminary field reconnaissance and preparations would be performed prior to fish releases. The field portion of the study releasing and tracking radio-tagged chinook would be conducted the four weeks prior to or immediately following the VAMP study period. A draft report will be prepared and submitted for peer review by appropriate members of the IEP by October 2001 and a final report, incorporating reviewer comments, will be completed and submitted within a month after receipt of comments. Up to two presentations will be given (on request) to scientific seminars or workshops in California within one year after completion of the study.

Table 1. Juvenile salmon migratory behavior study in the North, Central, and South Delta using radio telemetry.



Task 3 (North Delta)

Preliminary field reconnaissance and preparations would be performed during October 2001 (Table 1). The field portion of the study releasing and tracking radio-tagged chinook would be conducted during November 2001 and December 2001. A draft report will be prepared and submitted for peer review by appropriate members of the IEP by April 2002 and a final report, incorporating reviewer comments, will be completed and submitted within a month after receipt of comments. Up to two presentations will be given (on request) to scientific seminars or workshops in California within one year after completion of the study.

Task 4 – Project Management

The Project Management task will occur for the duration of the project (Table 1).

g. Feasibility

The use of radio telemetry to monitor the movements and behavior of young downstream migrant salmonids has been successfully used in a variety of fish passage investigations for approximately the past two decades. We will incorporate the knowledge we derived from our prior experiences using radio telemetry to study juvenile salmon in the Central Valley (e.g., Vogel et al. 1988, Vogel and Marine 1996) and the Delta (Vogel 1998, Vogel 2000). Through our own research previously described, we have amply demonstrated the efficacy of using radio-telemetry to study the migratory behavior of juvenile salmon. In particular, the prior work we performed using radio telemetry in the Delta in 1996, 1997, and 2000 demonstrated that this technique, when properly employed, provides valuable information relevant to the specific study design described in this proposal. Our knowledge of performing field work throughout the Delta places us in a position of implementing this project beyond that expected for a simple pilot-level field investigation. Figure 2 shows the telemetered locations of 50 juvenile late-fall chinook released and tracked in the Delta during the winter of 2000 which demonstrates how effective the technique is in determining movements and behavior patterns of outmigrating salmon.

All work will be coordinated between appropriate IEP agencies and NRS, Inc. prior to and during field activities. No permits will be required for the tasks to be performed by this proposed project. The project team has the expertise and support services necessary (see Qualifications) to perform the tasks within the proposed time line.

D. Applicability to CalFed's ERP Goals and Implementation Plan and CVPIA Priorities

1. ERP Goals and CVPIA Priorities

This project will assist in achieving the CalFed Goal 1: Recovery of at-risk native species dependent on the Delta. Knowledge obtained from this project will assist resource managers in developing appropriate measures to improve conditions for emigrating anadromous salmonids

from the Central Valley through the Delta. As described in the ERP, Goal 1 places highest priority on restoring populations of at-risk species that most strongly affect the operation of the SWP and CVP diversions in the south Delta, such as all runs of chinook salmon and steelhead trout.

Considerable restoration efforts are being made to improve fish and wildlife habitat in the delta. For example, one major effort (among many) under the CVPIA (Section 3406 (b) (2) utilizes CVP water resource management to improve fisheries habitat in the delta. One of the fish protective actions under this section of the Act involves export curtailment during the period of juvenile and yearling out-migration. The benefits and causal mechanisms for this action are not well understood and this specific research is meant to improve that understanding. Also, one element of the CVPIA, the Anadromous Fish Restoration Program, has need for provision of water from the San Joaquin tributaries to increase flows on the lower San Joaquin River at times to benefit fish and wildlife.

The USFWS AFRP has identified the direct and indirect impacts of the CVP and SWP Delta pumping operations as a significant factor limiting natural production of anadromous fish in the Central Valley . The USFWS has developed numerous actions in the Delta designed to improve the outmigration and survival ofjuvenile salmon in the Delta (e.g., Delta Cross Channel closures, export curtailments, positive Q west conditions (USFWS 1995 and 1997).

Information derived from this project will significantly improve our understanding ofjuvenile salmon outmigration behavior through the Delta which will allow for more informed decisions on future directions of the Delta ecosystem and Delta water management. For example, a better understanding of salmonid migratory behavior in the Delta is integral in choosing the most appropriate future water conveyance method and reducing adverse effects of water diversions on anadromous salmonids. In addition, reducing the uncertainties associated with our present knowledge of factors affecting outmigration salmonids in the Delta will assist in ensuring the most efficient allocation of restoration funds. The development of a hydrodynamic regime in the Delta that is favorable to the migration of all Central Valley anadromous salmonids (e.g., migratory cues) is a strategic objective for the CalFed ERPP.

2. Relationship to Other Ecosystem Restoration Projects

The San Joaquin River Agreement which, among other things, implements the Vernalis Adaptive Management Plan (VAMP). Under the VAMP, effects of flow and export from the Sacramento/San Joaquin River Delta upon salmon will be investigated. As part of that agreement, increased flows in the spring and fall will be provided in the Merced, Tuolumne, and Stanislaus Rivers.

The management of water throughout the Central Valley, particularly the delivery of water to the Delta for export, has altered natural flow patterns and ecological processes that maintain habitats in upstream rivers and tributaries and in the Delta (ERPP 1999). Information developed from

this project will improve our understanding on how to reduce the adverse effects of water diversions in the Delta so that the diversion of water, in conjunction with other restoration actions, does not impair other restoration efforts needed to restore ecological health to the Bay/Delta ecosystem. The watershed of highest priority for restoration in the CVPIA is assigned to the Delta largely because all anadromous fish in the Central Valley must pass through it as both juveniles and adults. It logically follows that this particular project complements and enhances all ecosystem restoration projects for anadromous fish upstream of the Delta because of the importance in improving outmigration conditions for salmon in the Delta.

An additional, important benefit from this project will be to provide insight on results of numerous past and ongoing juvenile salmon studies in the Delta such as coded-wire tagged mark/recapture investigations(e.g., VAMP and north Delta tagging studies; prior salmon survival studies).

3. System-Wide Ecosystem Benefits

This project is intended to contribute toward optimization of water supply management and water quality for fish habitat. This is compatible and integral to CalFed objectives for water quality and water supply reliability. This project is also intended to benefit the Interagency Ecological Program for the San Francisco Bay/Sacramento-San Joaquin Estuary who's agencies work together to develop a better understanding of the estuary's ecology and the effects of the SWP and CVP operations on the physical, chemical, and biological conditions of the estuary. To that end, this project will assist in the IEP's Mission: "Provide information on the factors that affect ecological resources in the Sacramento-San Joaquin Estuary that allows for more efficient management of the estuary" and the IEP Goal: "To provide for the collection and analysis of data needed to understand factors in the Sacramento-San Joaquin estuary controlling the distribution and abundance of selected fish and wildlife resources and make the data readily available to other agencies and the public".

E. Applicant Qualifications

Members of our project team used radio-telemetry to monitor movements of salmonids at a large Federal dam on the mainstream Sacramento River in California during an intensive long-term investigation during the 1980s (Hallock et. al. 1982, Vogel and Marine 1987, Vogel et. al. 1988, USFWS 1989). We have continued to use this innovative fish behavior monitoring technique to assess fish passage up to the present day. Dave Vogel of NRS, Inc. has long-term experience using radio-telemetry to study juvenile salmon migration. He was the first researcher to employ telemetry on juvenile salmonids in the Central Valley in the mid-1980s. Over the past 15 years, NRS staff has used telemetry to study fish migration in a wide variety of projects, including in Oregon and in California (Sacramento River, the Mokelumne River upstream of the Delta, and in the tidally-influenced Sacramento-San Joaquin Delta). Unlike other telemetry investigations in small rivers, these latter telemetry studies were performed in large-scale water bodies requiring complex field procedures.

The benefits of long-term experience in the use of telemetry to effectively evaluate fish migration cannot be overstated. Only expertise acquired through many years of use of telemetry under a wide variety of field conditions can allow researchers to properly employ the technique as a tool to assess fish migration. For example, some inexperienced individuals have attempted to employ telemetry in small rivers by simply placing transmitters inside fish using crude techniques and monitoring the movements of the traumatized fish; such techniques are not useful in acquiring a thorough understanding of fish migration behavior. Based on our extensive experience in fish radio telemetry studies, we have determined that a successful investigation mandates the use of extremely careful techniques to minimize fish stress associated with the radio telemetry procedure.

David Vogel, Project Manager/Senior Scientist
Natural Resource Scientists, Inc. Senior Scientist
M.S., 1979, Natural Resources (Fisheries), University of Michigan
B.S., 1974, Biology, Bowling Green State University

Mr. Vogel will serve as Project Manager and Senior Scientist for this project because of his expertise and knowledge of the Delta, Central Valley anadromous salmonids, and juvenile radio-telemetry investigations. Mr. Vogel specializes in aquatic resource assessments and resolution of fishery resource issues associated with land and water development. His 25 years of work experience in fisheries has included large-scale assessments in river systems, lakes and reservoirs, and estuaries. Most of his experience has been associated with restoration of western United States fishery resources. Mr. Vogel has worked as a biological consultant to define interrelationships of salmon resources and CVP water project operations. He was the Task Manager for the Biological Assessment of the 1992 operations of the CVP and was the principal biologist in charge of developing the long-term Biological Assessment for the CVP. Mr. Vogel has been working on Central Valley fishery resource research and management projects and interrelationships with water project operations for 20 years. He previously worked for the USFWS for 14 years; 10 years in charge of research projects for Sacramento River basin anadromous salmonids. He was the principal investigator for juvenile salmon migration studies in the Delta using radio-telemetry in 1996, 1997, and 2000.

Keith R. Marine, Fishery Biologist
Natural Resource Scientists, Inc., Fishery Biologist
MS., 1997, Ecology, University of California, Davis
B.S., 1983, Wildlife and Fisheries Biology, University of California, Davis

Mr. Marine specializes in the ecological sciences with emphasis on fisheries science, aquatic and marine biology, and physiological ecology. He has extensive experience in ecological and biological assessment and conducting research directed at resolving natural resource management problems. Mr. Marine has been involved with ecosystem-level investigations on fish migration and behavior associated with operation of large CVP facilities, including fish

responses to stream temperature alterations resulting from project operations. His expertise includes a comprehensive research background in thermal requirements and tolerances of California's native fishes, including Pacific anadromous salmonids. He has designed and performed temperature tolerance investigations and experiments for all the freshwater life phases of chinook salmon while working for the University of California, the U.S. Fish and Wildlife Service, and several water management agencies. Mr. Marine has performed evaluations of fish populations, fish habitat requirements, stream flow assessments and stream temperature modeling in support of fishery conservation and restoration programs. He is very experienced in radio telemetry procedures.

Russ Liebig, Field Biologist
Natural Resource Scientists, Inc., Fishery Biologist
B.S., 1998, Wildlife, Fisheries, and Consewation Biology, University of California, Davis

Mr. Liebig is employed by NRS as an Aquatic Field Biologist working on the Mokelumne and Merced Rivers conducting multiple anadromous fishery resource monitoring projects. These intensive field projects include monitoring ofjuvenile and adult salmon and steelhead migration on the Mokelumne River and juvenile salmonid downstream migration on Merced River. These projects also require tagging of wild and hatchery salmonids using several types of fish marking techniques. His duties also include fish trap calibration and maintenance. Mr. Liebig is knowledgeable and experienced in the methods and equipment used in radio-telemetry.

F. Cost

1. Budget
The budget for this project is shown in Table 2. The overall cost for this project is $210,000 over one year ($70,000 for each of 3 separable tasks). Individual tasks can be implemented independent of the other tasks. In addition, any combination of the tasks could be implemented. Overhead is 40 percent of total cost (far right column of Table 2) which includes workers compensation, office rent, phones, commercial general liability and professional liability insurance, state disability insurance, utilities, computer hardware and software, furniture, office equipment and supplies, and unbillable labor of support staff; benefits are 10 percent of total cost. Details on the work for each task are described in the project approach section and the work schedule.

2. Cost Sharing
Natural Resource Scientists, Inc. will provide $45,000 of in-kind contributions which includes the entire project management contribution to this project. The contributions will include overhead costs beyond that budgeted in this proposal. In addition, NRS, Inc. will provide all the draft and final technical report writing for a peer-reviewed final report and will provide up to two presentations at scientific seminars or workshops in California within one year following the field work (e.g., IEP meetings or workshops).

Table 2. Budget for the North. Central, and South Delta **Juvenile** Salmon Migration Study Using Radio-Telemetry

Year		Person/Position/Category	Direct Labor Hours	Salary	Benefits	Travel	Supplies & Expendables*	Service Contracts	Overhead** (40 %)	Exempt from Overhead Equipment	Exempt from Overhead Student Fee Remission	Total cost
Year 1	Central Delta Task 1	Senior Scientist	275	$12,306	$2,461				$9,845			$24.613
		Fishery Biologist	275	$6,969	$1.394				$5,575			$13,937
		Field Biologist	274	**$3.533**	$707				$2.827			$7,066
		Expenses				$4,508	$19,876					$24.384
	Central Delta Task 4***	Project Management & Reports In-kind Contribution										
	Central Delta Tasks 1&4	Central Delta Subtotals	824	$22,808	$4,562	$4,508	$19,876		$18,246			$70,000
	South Delta **Task2**	Senior Scientist	275	$12,306	$2,461				$9,845			$24.613
		Fishery Biologist	275	$6,969	$1,394				$5,575			$13.937
		Field Biologist	274	$3.533	$707				$2,827			$7,066
		Expenses				$4,508	$19.876					$24,384
	South Delta Task 4***	Project Management & Report! In-kind Contribution										
	South Della Tasks 2&4	South Delta Subtotals	824	$22,808	$4,562	$4,508	$19,876		$18,246			$70,000
	North Delta Task 3	Senior Scientist	275	$12.306	$2,461				$9,845			524,613
		Fishery Biologist	275	$6,969	$1,394				$5,575			$13.937
		Field Biologist	274	$3,533	$707				$2,827			$7.066
		Expenses				$4,508	$19,876					$24,384
	North Delta Task 4***	Project Management & Report! In-kind Contribution										
	North **Delta** Tasks 3&4	North Della Subtotals	824	$22,808	$4,562	$4,508	$19,876		$18,246			$70,000
otal Cost Year 1				$68,424	$13,685	$13,524	$59,628		$54,738			$210,000
otal **Project** Cost				$68,424	$13,685	$13,524	$59,628		$54,738			$210,000

* Includes purchase of expendable radio tags, rentals of radio receivers, antennae, electronic data loggers, vehicles and boats, fuel, and consumable field supplies

** Overhead includes workers compensation, office rent, phones, commercial general liability and professional liability insurance, state disability insurance, utilities, computer hardware and software, furniture, office equipment and supplies, and unbillable labor of support staff

*** In-kind project contribution by Natural Resource Scientists, Inc.

G. Local Involvement

No third-party impacts are anticipated. Land use changes will not occur as a result of this project. Those parties who support restoration of Central Valley anadromous salmonids would benefit. This project is intended to benefit the mission and goals of the Interagency Ecological Program and its participating agencies and the CalFed agencies. All work on this project will be coordinated through the IEP.

H. Compliance with Standard Terms and Conditions

The terms and conditions discussed in CalFed 2001 Proposal Solicitation Package are acceptable to the applicant. Forms 19 (Nondiscrimination Compliance), 4099 (Standard Clauses – Service & Consultant Service Contracts for $5,000 & over with Nonpublic Entities), and 4099a (Additional Standard Clauses) are attached.

I. Literature Cited

CalFed Bay-Delta Program. 1999. Ecosystem Restoration Program Plan, Strategic Plan for Ecosystem Restoration. Draft Programmatic EIS/EIR Technical Appendix. June 1999.

California Department of Fish and Game. 1993. Restoring Central Valley Streams: A Plan for Action. November 1993.

Carmichael, G.J. and J.R. Tomasso 1988. Survey of fish transportation equipment and techniques. Progressive Fish-Culturist *50:* 155-159.

Hallock, R.J., D.A. Vogel, and R.R. Reisenbichler. 1982. The effect of Red Bluff Diversion Dam on the migration of adult chinook salmon, *Oncorhynchus tshawytscha*, as indicated by radio tagged fish. California Department of Fish and Game. Anadromous Fisheries Branch Administrative Report No. 82-8. 47 pp.

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Diversion Dam gates on improving anadromous salmonid fish passage based on observations of radio-tagged fish. December 1989. USFWS Report No. AFF1-FAO-89-16. 15 pp.

U.S. Fish and Wildlife Service. 1995. Working paper on restoration needs: Habitat restoration actions to double natural production of anadromous fish in the Central Valley of California. Three volumes. May 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.

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Vogel, D.A. 1998. Radio-telemetered juvenile salmon migration study in the Sacramento-San Joaquin Delta. Presentation to Central Valley Salmon Team at the University of California - Davis September 15, 1998 workshop.

Vogel, D.A. and K.R. Marine. 1997. Fish passage and stress effects on juvenile chinook salmon physiology and predator avoidance abilities. Natural Resource Scientists, Inc. February 1997. 32 p. plus appendices.

Vogel, D.A. and K.R. Marine. 1996. Evaluation of the downstream migration of juvenile chinook salmon and steelhead in the lower Mokelumne River and the Sacramento-San Joaquin Delta (January through July 1994). Natural Resource Scientists, Inc. Prepared for the Mokelumne River Chinook Salmon and Steelhead Monitoring Program of the East Bay Municipal Utility District, Orinda, California. June 1996. 66 p. plus appendices.

Vogel, D.A. and K.R. Marine. 1994. Evaluation of the downstream migration of juvenile chinook salmon and steelhead in the Lower Mokelumne River and the Sacramento-San Joaquin Delta (January through July 1993). Vogel Environmental Services. April 1994. 59 p. with appendices.

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Vogel, D.A. and K.R. Marine. 1987. Evaluation of the Measure of Raising the Red Bluff Diversion Dam Gates on Improving Anadromous Salmonid Passage Based on Observations of Radio-Tagged Fish. U.S. Fish and Wildlife Service Report No. FR1/FAO-87-21, 13 p.

Vogel, D.A. 1991. The Human Side of Fisheries Science. Chapter in ***California's Salmon and Steelhead: Perspectives on an Imperiled Resource.*** University of California Press. p. 124-134.

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migration study in the Sacramento-San Joaquin Delta during 1996 and 1997. Presentation to Central Valley Salmon Team at the University of California - Davis September 15, 1998 workshop.

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Wedemeyer, *G*. 1992. Transporting and handling smolts. World Aquaculture 23: 47-50.

J. Threshold Requirements

The letters of Notification, Environmental Compliance Checklist, Land Use Checklist, and contract forms are attached.

NATURAL RESOURCE SCIENTISTS, INC.

P.O. Box 1210
Red Bluff, California 96080
(530) 527-9587 - Office
(530) 527-6181 - FAX

Sacramento Co. Board of Supervisors
Attn: Clerk of the Board
700 H Street, Suite 2450
Sacramento. CA 95814

Re: Intent to Submit a Proposal for CalFed Funding

Dear Board Members:

The CalFed Bay-Delta Program has solicited proposals for ecosystem restoration programs and projects to improve the health of the Bay-Delta ecosystem. The proposal submittals are due on May 15,2000.

In an effort to keep the Sacramento County Board of Supervisors informed of project applications of this nature, please accept this letter as Natural Resource Scientists, Inc.'s intention of submitting the attached proposal for a study to be performed in Sacramento, San Joaquin, Contra Costa and Solano Counties, entitled "Juvenile Salmon Migratory Behavior Study in the North, Central, and South Delta Using Radio Telemetry".

As Project Manager, please feel free to contact me at (530) 527-9587, extension 11, if you have my questions about this important study.

Sincerely,

David A. Vogel

David A. Vogel
Senior Scientist

Enclosure

NATURAL RESOURCE SCIENTISTS, INC.
P.O. Box 1210
Red Bluff, California 96080
(530) 527-9587 - Office
(530) 527-6181 - FAX

Sacramento County Planning & Community Development Dept.
827- 7th Street, Room 230
Sacramento, CA 95814

Re: Intent to Submit a Proposal for CalFed Funding

Dear Sirs:

The CalFed Bay-Delta Program has solicited proposals for ecosystem restoration programs and projects to improve the health of the Bay-Delta ecosystem. The proposal submittals are due on May 15,2000.

In an effort to keep Sacramento County informed of project applications of this nature, please accept this letter as Natural Resource Scientists, Inc.'s intention of submitting the attached proposal for a study to be performed in Sacramento, San Joaquin, Contra Costa and Solano Counties, entitled "Juvenile Salmon Migratory Behavior Study in the North, Central, and South Delta Using Radio Telemetry".

As Project Manager, please feel free to contact me at (530) 527-9587, extension 11, if you have any questions about this important study.

Sincerely,

David A. Vogel

David A. Vogel
Senior Scientist

Enclosure

NATURAL RESOURCE SCIENTISTS, INC.

P.O. Box 1210
Red Bluff; California 96080
(530) 527-9587 - Office
(530) 527-6181 - FAX

San Joaquin Co. Board of Supervisors
Lois Sahyoun, **Clerk** of the Board
Courthouse, Room 701
222 East Weber Avenue
Stockton, CA **95202**

Re: Intent to Submit a Proposal for CalFed Funding

Dear Ms. Sahyoun:

The CalFed Bay-Delta Program has solicited proposals for ecosystem restoration programs and projects to improve the health of the Bay-Delta ecosystem. The proposal submittals are due on May **15, 2000.**

In an effort to keep the San Joaquin County Board of Supervisors informed of project applications of this nature, please accept this letter as Natural Resource Scientists, Inc.'s intention of submitting the attached proposal for a study to be performed in Sacramento, San Joaquin, Contra Costa and Solano Counties, entitled. "Juvenile Salmon Migratory Behavior Study in the North, Central, and South Delta Using Radio Telemetry".

As Project Manager, please feel free to contact me at **(530)** 527-9587, extension 11, if you have any questions about this important study,

Sincerely,

David A. Vogel

David **A.** Vogel
Senior Scientist

Enclosure

NATURAL RESOURCE SCIENTISTS, INC.
P.O. Box 1210
Red Bluff; California 96080
(530) 527-9587 - Office
(530) 527-6181 - FAX

San Joaquin Co. Community Development Dept.
Planning Division
1810 E. Hazelton
Stockton, CA 95205

Re: Intent to Submit a Proposal for CalFed Funding

Dear Sirs:

The CalFed Bay-Delta Program has solicited proposals for ecosystem restoration programs and projects to improve the health of the Bay-Delta ecosystem. The proposal submittals are due on May 15,2000.

In an effort to keep San Joaquin County informed of project applications of this nature, please accept this letter as Natural Resource Scientists, Inc.'s intention of submitting the attached proposal for a study to be performed in Sacramento, San Joaquin, Contra Costa and Solano Counties, entitled "Juvenile Salmon Migratory Behavior Study in the North, Central, and South Delta Using Radio Telemetry".

As Project Manager, please feel free to contact me at (530) **527-9587,** extension 11, if you have any questions about this important study.

Sincerely,

David A. Vogel

David **A.** Vogel
Senior Scientist

Enclosure

NATURAL RESOURCE SCIENTISTS, INC.

P.O. Box 1210
Red Bluff; California 96080
(530) 527-9587- Office
(530) 527-6181 - FAX

Contra Costa Co. Board of Supervisors
Attn: Office of the Clerk of the Board
651 Pine Street
Martinez, CA 94553

Re: Intent to Submit a Proposal for CalFed Funding

Dear Board Members:

The CalFed Bay-Delta Program has solicited proposals for ecosystem restoration programs and projects to improve the health of the Bay-Delta ecosystem. The proposal submittals are due on May 15,2000.

In an effort to keep the Contra Costa County Board of Supervisors informed of project applications of this nature, please accept this letter as Natural Resource Scientists, Inc.'s intention of submitting the attached proposal for a study to be performed in Sacramento, San Joaquin, Contra Costa and Solano Counties, entitled: "Juvenile Salmon Migratory Behavior Study in the **North,** Central, and South Delta Using Radio Telemetry".

As Project Manager, please feel free to contact me at (530) 527-9587, extension 11, if you have any questions about this important study.

Sincerely,

David A. Vogel

David A. Vogel
Senior Scientist

Enclosure

NATURAL RESOURCE SCIENTISTS, INC.
P.O. Box 1210
Red Bluff, California 96080
(530) 527-9587 - Office
(530) 527-6181 - FAX

Contra Costa Co. Community Development Dept.
Planning Division
651 Pine Street, Second Floor, North Wing
Martinez, CA 94553

Re: Intent to Submit a Proposal for CalFed Funding

Dear *Sirs:*

The CalFed Bay-Delta Program has solicited proposals for ecosystem restoration programs and projects to improve the health of the Bay-Delta ecosystem. The proposal submittals are due on May 15,2000.

In an effort to keep Contra Costa County informed of project applications of this nature, please accept this letter as Natural Resource Scientists, Inc.'s intention of submitting the attached proposal for a study to be performed in Sacramento, San Joaquin, Contra Costa and Solano Counties, entitled "Juvenile Salmon Migratory Behavior Study in the North, Central, and South Delta Using Radio Telemetry".

As Project Manager, please feel free to contact me at (530) 527-9587, extension 11, if you have any questions about this important study.

Sincerely,

David A. Vogel

David A. Vogel
Senior Scientist

Enclosure

NATURAL RESOURCE SCIENTISTS, INC.

P.O. Box 1210
Red Bluff, California 96080
(530) 527-9587 - Office
(530) 527-6181 - FAX

Delta Protection Commission
14215 River Road
P.O. Box 530
Walnut Grove, CA 95690

Re: Intent to Submit a Proposal for CalFed Funding

Dear Sirs:

The CalFed Bay-Delta Program has solicited proposals for ecosystem restoration programs and projects to improve the health of the Bay-Delta ecosystem. The proposal submittals are due on May 15,2000.

In an effort to keep the Delta Protection Commission informed of project applications of this nature, please accept this letter as Natural Resource Scientists, Inc.'s intention of submitting the attached proposal for a study to be performed in Sacramento, San Joaquin, Contra Costa and Solano Counties entitled "Juvenile Salmon Migratory Behavior Study in the North, Central, and South Delta Using Radio Telemetry".

As Project Manager, please feel free to contact me at (530) 527-9587, extension 11, if you have any questions about this important study.

Sincerely,

David A. Vogel

David A. Vogel
Senior Scientist

Enclosure

NATURAL RESOURCE SCIENTISTS, INC.

P.O. Box 1210
Red Bluff, California 96080
(530) 527-9587 - Office
(530) 527-6181 - FAX

Bay Conservation & Development Commission
30 Van Ness Avenue, Room 2011
San Francisco, CA 94102

Re: Intent to Submit a Proposal for CalFed Funding

Dear **Sirs:**

The CalFed Bay-Delta Program has solicited proposals for ecosystem restoration programs and projects to improve the health of the Bay-Delta ecosystem. The proposal submittals are due on May 15,2000.

In an effort to keep the Bay Conservation & Development Commission informed of project applications of this nature, please accept this letter as Natural Resource Scientists, Inc.'s intention of submitting the attached proposal for a study to be performed in Sacramento, San Joaquin, Contra Costa and Solano Counties, entitled "Juvenile Salmon Migratory Behavior Study in the North, Central, and South Delta Using Radio Telemetry".

As Project Manager, please feel free to contact me at (530) 527-9587, extension 11, if you have any questions about this important study.

Sincerely,

David A. Vogel

David **A.** Vogel
Senior Scientist

Enclosure

NATURAL RESOURCE SCIENTISTS, INC.

P.O. Box 1210
Red Bluff, California 96080
(530) 527-9587 - Office
(530) 527-6181 - FAX

Solano ***Co.*** Board of Supervisors
Attn: Clerk of the Board
580 Texas Street
Fairfield, **CA 94533**

Re: Intent to Submit a Proposal for CalFed Funding

Dear Board Members:

The CalFed Bay-Delta **Program** has solicited proposals for ecosystem restoration programs and projects to improve the health of the Bay-Delta ecosystem. The proposal submittals are due on May 15,2000.

In an effort to keep the Solano County Board of Supervisors informed of project applications of this nature, please accept this letter as Natural Resource Scientists, Inc's intention of submitting the attached proposal for a study to be performed in Sacramento, San Joaquin, Contra Costa and **Solano** Counties, entitled: "Juvenile Salmon Migratory Behavior Study in the North, Central, and South Delta Using Radio Telemetry".

As Project Manager, please feel free to contact me at (530) 527-9587, extension 11, if you have any questions about this important study.

Sincerely,

David A. Vogel

David **A.** Vogel
Senior Scientist

Enclosure

NATURAL RESOURCE SCIENTISTS, INC.
P.O. Box 1210
Red Bluff; California 96080
(530) 527-9587 - Office
(530) 527-6181 - FAX

Solano Co. Department of Environmental Management
Planning Services Division
601 Texas Street
Fairfield, CA **94533**

Re: Intent to Submit a Proposal for CalFed Funding

Dear **Sirs:**

The CalFed Bay-Delta Program has solicited proposals for ecosystem restoration programs and projects to improve the health of the Bay-Delta ecosystem. The proposal submittals are due on **May 15,2000.**

In **an** effort to keep Solano County informed of project applications of this nature, please accept this letter as Natural Resource Scientists, Inc.'s intention of submitting the attached proposal for a study to be performed in Sacramento, San Joaquin, Contra Costa and Solano Counties, entitled: "Juvenile Salmon Migratory Behavior Study Study in the North, Central, and South Delta **Using** Radio Telemetry".

As Project Manager, please feel free to contact me at **(530) 527-9587,** extension 11, if you have **any** questions about this important study.

Sincerely,

David A. Vogel

David **A.** Vogel
Senior Scientist

Enclosure

Environmental Compliance Checklist

All applicants must fill out this Environmental Compliance Checklist. Applications must contain answers to the following questions to be responsive and to be considered for funding. *Failure to answer these questions and include them with the application will result in the application being considered nonresponsive and not considered for funding.*

1. **Do any of the actions included in the proposal require compliance with either the California Environmental Quality Act (CEQA), the National Environmental Policy Act (NEPA), or both?**

_____ **YES** X NO

2. **If you** answered **yes** to # 1, identify the lead governmental agency for CEQA/NEPA compliance,

_____
Lead Agency

3. **If you** answered no to # 1, explain why CEQA/NEPA compliance is not required for the actions in the proposal.

Research project **only.**

4. **If CEQA/NEPA** compliance **is** required, describe how the project **will** comply with either or both of these laws. Describe where the project is in the compliance process and the expected date of completion.

5. **Will** the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?

_____ **YES** X **NO**

If yes, the applicant must attach written permission for access from the relevant property owner(s). Failure to include written permission for access may result in disqualification of the proposal during the review process. Research and monitoring **field** projects for which specific field location, have not been identified **will** be required to provide access needs and permission for access with 30 days **of** notification of approval.

6. Please indicate what permits or other approvals may be required for the activities contained in your pruposal. Check all boxes that apply.

LOCAL		
Conditional use permit	___	
Variance	___	
Subdivision Map Act approval	___	
Grading permit	___	
General plan amendment	___	
Specific plan approval	___	
Rezone		___
Williamson Act Contract cancellation	___	
Other _____ (please specify)		
None required	X	
STATE		
CESA Compliance	___	(CDFG)
Streambed alteration permit	___	(CDFG)
CWA §401 certification	___	(RWQCB)
Coastal development permit	___	(Coastal Commission/BCDC)
Reclamation Board approval	___	
Notification	___	(DPC, BCDC)
Other _____ (please specify)		
None required	X	
FEDERAL		
ESA Consultation	___	(USFWS)
Rivers & Harbors Act permit	___	(ACOE)
CWA § 404 permit	___	(ACOE)
Other _____ (please specify)		
None required	X	

DPC = Delta Protection Commission
CWA = Clean Water Act
CESA = California Endangered Species Act
USFWS = U.S. Fish and Wildlife Service
ACOE = U.S. Army Corps of Engineers

ESA = Endangered Species Act
CDFG = California Department of Fish and Game
RWQCB = Regional Water Quality Control Board
BCDC= Bay Conservation and Development Comm.

Land Use Checklist

All applicants must fill out this Land Use Checklist for their proposal. Applications must contain answers to the following questions to be responsive and to be considered for funding. *Failure to answer these questions and include them with the application will result in the application being considered nonresponsive and not considered for funding.*

1. **Do** the actions in the proposal **involve** physical changes to the land (i.e. grading, planting vegetation, or breeching **levees)** or restrictions in land use (i.e. conservation easement or placement of land in a wildlife refuge)?

   _____ YES X NO

2. **If NO** to # **1,** explain what type of actions are Involved in the proposal (i.e., research only. planning only).

   research only

3. **If YES** to **# 1,** what **is** the proposed land use change or restriction under the proposal?

4. **If YES** to # I, **is** the land currently under a Williamson Act contract?

   _____ YES _____ NO

5. **If YES** to **# 1,** answer the following:

   Current land **use** _____
   Current zoning _____
   Current general plan designation _____

6. **If YES** to **#1,** is the land classified as Prime Farmland, Farmland of Statewide Importance or Unique Farmland **on** the Department **of** Conservation Important Farmland Maps?

   _____ YES _____ NO _____ DON'T KNOW

7. **If YES** to **# 1,** how many acres of land will be subject to physical change or land use restrictions under the proposal?

   _____

8. **If YES to # 1, is** the property currently being commercially farmed or grazed?

   _____ YES **NO**

9. **If YES** to **#8,** what are the number **of** employees laacre_____
   the total number **of** employees _____

10. Will the applicant acquire **any** interest in land under the proposal (fee title or a conservation easement)?

_____	X
YES	NO

11. What entity/organization will hold the interest?_____

12. **If YES to # 10,** answer the following:

Total number of acres to be acquired under proposal	_____
Number **of** acres **to** be acquired in fee	_____
Number **of** acres to **be** subject to conservation easement	_____

13. **For** all proposals involving physical changes to the land **or** restriction **in** land use, describe what entity or organization will:

manage the property	_____
provide operations and maintenance services	_____
conduct monitoring	_____

14. **For** land acquisitions (fee title or easements), **will** existing water rights **also** be acquired?

_____	_____
YES	**NO**

15. Does the applicant propose **any** modifications to the water right or change in the delivery of the water?

_____	X
YES	**NO**

16. **If YES** *to* **# 15,** describe_____

STATE OF CALIFORNIA

NONDISCRIMINATION COMPLIANCE STATEMENT

STD. 19 (REV. 3-95) FMC

COMPANY NAME

Natural Resouce Scientists, Inc.

Thecompany named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990(a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employe or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

OFFICIAL'S NAME

David A. Vogel

DATE EXECUTED

May 12, 2000

EXECUTED IN THE COUNTY OF

Tehama

PROSPECTIVE CONTRACTOR'S SIGNATURE

David A. Vogel

PROSPECTIVE CONTRACTOR'S TITLE

President/Senior Scientist

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

Natural Resource Scientists, Inc.

STANDARD CLAUSES - SERVICE & CONSULTANT SERVICE CONTRACTS FOR $5,000 & OVER WITH NONPUBLIC ENTITIES

Workers' Compensation Clause. Contractor affirms that it is aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that Code, and Contractor affirms that it will comply with such provisions before commencing the performance of the work under this contract.

National Labor Relations Board Clause. In accordance with Public Contract Code Section 10296, Contractor declares under penalty of perjury that no more than one final, unappealable finding of contempt of court by a federal court has been issued against the Contractor within the immediately preceding two-year period because of Contractor's failure to comply with an order of a federal court which orders Contractor to comply with an order of the National Labor Relations Board.

Nondiscrimination Clause. During the performance of this contract, the recipient/Contractor and its subcontractors shall not deny the contract's benefits to any person on the basis of religion, color, ethnic group identification, sex, age, physical or mental disability, nor shall they discriminate unlawfully against any employee or applicant for employment because of race, religion, color, national origin, ancestry, physical handicap, mental disability, medical condition, marital status, age (over 40), or sex. Contractor shall ensure that the evaluation and treatment of employees and applicants for employment are free of such discrimination. Contractor shall comply with the provisions of the Fair Employment and Housing Act (Government Code Section 12960 et seq.) and the regulations promulgated thereunder (California Administrative Code, Title 2, Sections 7285.0 et seq.); the provisions of Article 9.5, Chapter 1, Part 1, Division 3, Title 2 of the Government Code (Government Code Sections 11135 - 11139.5), and the regulations or standards adopted by the awarding State agency to implement such article. Contractor or recipient shall permit access by representatives of the Department of Fair Employment and Housing and the awarding State agency upon reasonable notice at any time during the normal business hours, but in no case less than 24 hours' notice, to such of its books, records, accounts, other sources of information, and its facilities as said Department or Agency shall require to ascertain compliance with this clause. Recipient, Contractor and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement. The Contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the contract.

Statement of Compliance. The Contractor's signature affixed hereon and dated shall constitute a certification under penalty of perjury under the laws of the State of California that the Contractor has, unless exempted, complied with the nondiscrimination program requirements of Government Code Section 12990 and Title 2, California Code of Regulations, Section 8103.

Performance Evaluation. For consulting service agreements, Contractor's performance under this contract will be evaluated after completion. A negative evaluation will be filed with the Department of General Services.

Availability of Funds. Work to be performed under this contract is subject to availability of funds through the State's normal budget process.

Audit Clause. For contracts in excess of $10,000, the contracting parties shall be subject to the examination and audit of the State Auditor for a period of three years after final payment under the contract (Government Code Section 8546.7).

Payment Retention Clause. Ten percent of any progress payments that may be provided for under this contract shall be withheld per Public Contract Code Sections 10346 and 10379 pending satisfactory completion of all services under the contract.

Reimbursement Clause. If applicable, travel and per diem expenses to be reimbursed under this contract shall be at the same rates the State provides for unrepresented employees in accordance with the provisions of Title 2, Chapter 3, of the California Code of Regulations. Contractor's designated headquarters for the purpose of computing such expenses shall be _____.

Disabled Veteran Business Enterprise Participation Requirement Audit Clause. Contractor or vendor agrees that the awarding department or its delegates will have the right to review, obtain, and copy all records pertaining to performance of the contract. Contractor or vendor agrees to provide the awarding department or its delegatee access to its premises, upon reasonable notice, during normal business hours for the purpose of interviewing employees and inspecting and copying such books, records, accounts, and other materials that may be relevant to a matter under investigation for the purpose of determining compliance with Public Contract Code Section 10115 et seq. Contractor or vendor agrees to maintain such records for a period of three (3) years after final payment under the contract. Title 2 CCR Section 1896.75.

Priority Hiring Considerations. For contracts in excess of $200,000, the Contractor shall give priority consideration in filling vacancies in positions funded by the contract to qualified recipients of aid under Welfare and Institutions Code Section 11200. (Public Contract Code Section 10353).

Drug-Free Workplace Certification. By signing this contract, the Contractor or grantee hereby certifies under penalty of perjury under the laws of the State of California that the Contractor or grantee will comply with the requirements of the Drug-Free Workplace Act of 1990 (Government Code Section 8350 et seq.) and will provide a drug-free workplace by taking the following actions:

1. Publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited and specifying actions to be taken against employees for violations.

2. Establish a Drug-Free Awareness Program to inform employees about all of the following:

   (a) The dangers of drug abuse in the workplace,
   (b) The person's or organization's policy of maintaining a drug-free workplace,
   (c) Any available counseling, rehabilitation and employee assistance programs, and
   (d) Penalties that may be imposed upon employees for drug abuse violations.

3. Every employee who works on the proposed contract or grant:

   (a) Will receive a copy of the company's drug-free policy statement, and
   (b) Will agree to abide by terms of the company's statement as a condition of employment on the contract or grant.

This contract or grant may be subject to suspension of payments or termination, or both, and the Contractor or grantee may be subject to debarment if the department determines that: (1) the Contractor or grantee has made a false certification, or (2) the Contractor or grantee violates the certification by failing to carry out the requirements noted above.

Antitrust Claims. In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder. See Government Code Section 4552.

If an awarding body or public purchasing body received, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery. See Government Code Section 4553.

Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action. See Government Code Section 4554.

Americans With Disabilities Act. By signing this contract, Contractor assures the state that it complies with the Americans With Disabilities Act (ADA) of 1990, (42 U.S.C. 12101 et seq.), which prohibits discrimination on the basis of disability, as well as all applicable regulations and guidelines issued pursuant to the ADA.

Corporate Qualifications To Do Business in California. Contractor must be currently qualified to do business in California as defined by the Revenue & Taxation Code, Section 23101 unless exempted. Both domestic and foreign corporations (those incorporated outside of California) must be in good standing in order to be qualified to do business in California.

Former State Employees: a) For the two-year period from the date he or she left State employment, no former State officer or employee may enter into a contract in which he or she engaged in any of the negotiations, transactions, planning, arrangements or any part of the decision-making process relevant to the contract while employed in any capacity by any State agency. b) For the twelve-month period from the date he or she left State employment, no former State officer or employee may enter into a contract with any State agency if he or she was employed by that State agency in a policy-making position in the same general subject area as the proposed contract within the twelve-month period prior to his or her leaving State service.

Agreement No._____

ADDITIONAL STANDARD CLAUSES

Recycled Materials. Contractor hereby certifies under penalty of perjury thal ____ (enter value or "0" here) percent of the materials, goods and supplies offered or products used in the performance of this Agreement meets or exceeds the minimum percentage of recycied material as defined in Sections 12161 and 12200 of the Public Contract Code,

Severability. If any provision of this Agreement is held invalid or unenforceable by any court of final Jurisdiction,it is the intent of the parties that all other provisions of this Agreement be construed to remain fully valid, enforceable. and binding on the parties.

Governing Law. This Agreement is governed by and shall be interpreted in accordance with the laws of the State of California.

Y2K Language. The Contractor warrants and represents that the goods or services **sold,** leased, or licensed to the Stare of California, its agencies, or its political subdivisions, pursuant to this Agreement are 'Year 2000 compliant,' For purposes of this Agreement a good or service is Year 2000 compliant if it will continue to fully function Defore. at, and after the Year 2000 without interruption and, if applicabie, with full ability to accurately an3 unambiguously process, display, compare, calculate, manipuiate. and otherwise utilize date information. This warranty and representation supersedes all warranty disclaimers and limitations and all limitations on liability provided by or through the Contractor.

Child Support Compliance Act. For any Agreement in excess of $100,000, the Conlractor acknowledges in accordance therewith, that:

1. The Contractor recognizes the importance of child and family support obligations and shall fully comply with all applicable state and federal laws relating to child and family support enforcement. including. but not limited to. disclosure of information and compliance with earnings assignment orders, as provided in Chapter 5 (commencing with Section 5200) of Part 5 of Division 9 of the Family Code; and

2. The Contractor, to the best of its knowledge, is fully wmplying with the earnings assignment orders of all employees and is providing the names of all new empioyees to the New Hire Registry maintained by the Californ 3 Employment Development Department.